

REMARKS

This is intended as a full and complete response to the Final Office Action dated November 10, 2003, having a shortened statutory period for response set to expire on February 10, 2004. Claims 1-5, 7-11, 18, and 32 are pending in this application. Claims 1-5, 7-11, and 32 stand rejected. The Examiner has indicated that claim 18 is allowable. Applicants have canceled claims 12-17 and 19-31 and have amended claims 8 and 11 as to matters of form. Applicants submit that the changes made herein do not introduce new matter and reduce the issues for appeal.

Claims 1-3, 5, and 32 are rejected under 35 U.S.C. § 102(e) as being anticipated by *Hills, et al.* (U.S. Patent No. 6,217,786) on grounds that *Hills, et al.* discloses exposing a substrate to a cleaning/etching process comprising a plasma from the gas mixture consisting of the non-reactive gas argon and reactive fluorine containing gas (*i.e.*, C₄F₈) (Table in column 6). Applicants respectfully traverse the rejection.

Hills, et al. describes etching an oxide layer with a plasma formed from an etching gas that includes a fluorocarbon gas, N₂, O₂, an inert carrier gas, and a hydrogen-containing additive gas (column 2, lines 53-64, column 6, Table 2). The Examiner asserts that as Applicants have claimed a pre-cleaning method "comprising" various elements, including forming a plasma from a gas mixture consisting of a non-reactive gas and a reactive gas selected from the group consisting of fluorine containing gases and hydrogen, he may interpret any additional gas used in the prior art process as belonging to other elements that are not excluded from the claims as a whole (*i.e.*, any additional gas in the prior arts can be interpreted as another plasma mixture).

Applicants agree with the Examiner that claim 1 does not exclude other plasma mixtures. However, Applicants submit that the Examiner cannot ignore Applicants' claimed element of a plasma from a gas mixture consisting of a non-reactive gas and a reactive gas selected from the group consisting of fluorine containing gases and hydrogen. Applicants submit that there is no basis for finding a teaching or suggestion of a plasma from a gas mixture consisting of a non-reactive gas and a reactive gas selected from the group consisting of fluorine containing gases and hydrogen in *Hills, et al.*, which describes a plasma from a gas mixture that includes a fluorocarbon gas, N₂,

O₂, an inert carrier gas, and a hydrogen-containing additive gas. There is no teaching or suggestion in *Hills, et al.* to split the gas mixture including a fluorocarbon gas, N₂, O₂, an inert carrier gas, and a hydrogen-containing additive gas into two gas mixtures, one of which consists of an inert carrier gas and a hydrogen-containing additive gas.

Thus, *Hills, et al.* does not teach, show, or suggest a method for pre-cleaning apertures on a substrate, the method comprising disposing the substrate on a substrate support member in a process chamber, cooling the substrate to a temperature of 100 degrees Celsius or less, and exposing the substrate to a pre-clean process comprising forming a plasma from a gas mixture consisting of a non-reactive gas and a reactive gas selected from the group consisting of fluorine containing gases and hydrogen, as recited in claim 1. Applicants respectfully request withdrawal of the rejection of claim 1 and of claims 2, 3, 5, and 32, which depend thereon.

Claim 10 and 11 are rejected under 35 U.S.C. § 102 (e) as being unpatentable over *Chou, et al.* (U.S. Patent No. 6,337,277) on grounds that *Chou, et al.* discloses exposing a substrate to a cleaning/etching process comprising a plasma from the gas mixture consisting of a non-reactive gas (column 9, line 42-43). Applicants respectfully traverse the rejection.

Chou, et al. describes etching a substrate with a plasma of oxygen, and optionally, argon, helium, and nitrogen (column 9, lines 1, 42-43). The Examiner asserts that as Applicants have claimed a pre-cleaning method "comprising" various elements, including forming a plasma from a gas mixture consisting of a non-reactive gas, he may interpret any additional gas used in the prior art process as belonging to other elements that are not excluded from the claims as a whole (*i.e.*, any additional gas in the prior arts can be interpreted as another plasma mixture).

As discussed above with respect to claim 1, Applicants agree with the Examiner that a claim reciting a method that comprises forming a plasma from a gas mixture consisting of a non-reactive gas does not exclude other plasma mixtures. However, Applicants submit that the Examiner cannot ignore Applicants' claimed element of a plasma from a gas mixture consisting of a non-reactive gas. Applicants submit that there is no basis for finding a teaching or suggestion of a plasma from a gas mixture consisting of a non-reactive gas in *Chou, et al.*, which describes a plasma from a gas

mixture that includes a oxygen, and optionally, argon, helium, and nitrogen. There is no teaching or suggestion in *Chou, et al.* to split the gas mixture including oxygen, and optionally, argon, helium, and nitrogen into two gas mixtures, one of which consists of a non-reactive gas.

Thus, *Chou, et al.* does not teach, show, or suggest a method for pre-cleaning apertures on a substrate, the method comprising disposing the substrate on a substrate support member in a process chamber, electrostatically chucking the substrate to the substrate support member, cooling the substrate to less than about 100 degrees Celsius, and exposing the substrate a pre-clean process comprising a plasma formed from a gas mixture consisting of a non-reactive gas, as recited in claim 10. Applicants respectfully request withdrawal of the rejection of claim 10, and of claim 11, which depends thereon.

Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Hills, et al.* in view of *Maxwell, et al.* (U.S. Patent No. 5,996,353). Applicants submit that claim 4 is patentable over *Hills, et al.* in view of *Maxwell, et al.* for the reasons discussed above with respect to claim 1, upon which claim 4 depends. Applicants respectfully request withdrawal of the rejection of claim 4.

Claims 7-9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Hills, et al.* in view of *Subrahmanyam, et al.* (U.S. Patent No. 6,107,192). *Subrahmanyam, et al.* describes cleaning features of a substrate with a plasma generated by a remote plasma source and comprising a reactive gas such as oxygen, a mixture of CF_4/O_2 , or a mixture of He/NF_3 . *Subrahmanyam, et al.* does not disclose the temperature of the substrate during the above plasma cleaning step or suggest that the temperature of the plasma cleaning step is important. Applicants submit that *Subrahmanyam, et al.*, alone or in combination with *Hills, et al.* does not suggest or motivate using the gas mixtures of *Subrahmanyam, et al.* in the process of *Hills, et al.* *Hills, et al.* describes a plasma from a gas mixture of a fluorocarbon gas, N_2 , O_2 , an inert carrier gas, and a hydrogen-containing additive gas and teaches the benefits of each the gases in the mixture (column 4, line 57 to column 5, line 25). *Hills, et al.* in view of *Subrahmanyam, et al.* does not teach or suggest a pre-cleaning method that includes cooling a substrate to a temperature of 100 degrees Celsius or less and exposing the

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substrate to a pre-clean process comprising forming a plasma from a gas mixture consisting of a non-reactive gas and a reactive gas selected from the group consisting of fluorine containing gases and hydrogen, as recited in claim 1. As claims 7-9 include all of the limitations of claim 1, *Hills, et al.* in view of *Subrahmanyam, et al.* does not provide all of the limitations of claims 7-9. Applicants respectfully request withdrawal of the rejection of claims 7-9.

Claims 13-15, 17, and 22-31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chou, et al.* in view of *Subrahmanyam, et al.* Applicants submit that this rejection is now moot, as Applicants have canceled claims 13-15, 17, and 22-31.

Claims 19-20, 27-28, and 30-31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chou* and *Denning, et al.* in view of each other. Applicants submit that this rejection is now moot, as Applicants have canceled claims 19-20, 27-28, and 30-31.

Claim 21 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chou* and *Denning* as applied to claim 20 above, and further in view of *Subrahmanyam, et al.* Applicants submit that this rejection is now moot, as Applicants have canceled claim 21.

In conclusion, the references cited by the Examiner, neither alone nor in combination, teach, show, or suggest the method or apparatus of the present invention.

Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



Keith M. Tackett
Registration No. 32,008
MOSER, PATTERSON & SHERIDAN, L.L.P.
3040 Post Oak Blvd., Suite 1500
Houston, TX 77056
Telephone: (713) 623-4844
Facsimile: (713) 623-4846
Attorney for Applicant(s)

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